



NOTES

COCCOBACILLI: AEROBES

MICROBE OVERVIEW

- Intermediate shape between cocci (spherical bacteria), bacilli (rod-shaped bacteria)
- Gram-negative, obligate aerobe, non-motile, non-spore forming

COCCOBACILLI: AEROBES SUMMARY

SPECIES	HOST	MODE OF TRANSMISSION	PATHOLOGY
BORDETELLA PERTUSSIS	Humans	Aerosol droplets	Pertussis (whooping cough)
FRANCISELLA TULARENSIS	Humans, rabbits, deer, rodents	Contact with infected animals/arthropod vectors	Tularemia (rabbit fever)

BORDETELLA PERTUSSIS (PERTUSSIS/WHOOPING COUGH)

osms.it/bordetella-pertussis

PATHOLOGY & CAUSES

- Infectious agent, causes pertussis
- Strict human pathogen
- Tropism to respiratory epithelium

Pathophysiology

- Bacteria enters upper respiratory tract, releases toxins
- Filamentous hemagglutinin, pertactin, agglutinin
 - Anchors to epithelial cells
- Tracheal cytotoxin
 - Paralysis of respiratory cilia → ↑ accumulation of mucus in airways → violent cough reflex
- Pertussis toxin
 - Stimulates T cells to divide, blocks them from leaving blood, migrating into tissues → lymphocytosis
 - ↑ sensitivity of respiratory tissues to histamine → ↑ vascular permeability → fluid leaks into airway tissues → airway edema → dyspnea

VISIT...

LANZAROTE
Caliente.COM

- Adenylate cyclase toxin
 - ↑ conversion of adenosine triphosphate (ATP) to **cyclic adenosine monophosphate** (AMP) within phagocytes → disbalance in cellular signaling mechanism → phagocytes unable to correctly respond to infection, undergo apoptosis

Stages of infection

- **Catarrhal**: follows incubation period (approx. one week); lasts two weeks, very contagious
- **Paroxysmal**: 1–6 weeks
- **Convalescent**: 2–3 weeks

RISK FACTORS

- Infants too young to have completed immunization
- Unimmunized individuals
- Debilitation of immune system

COMPLICATIONS

- Apparent life-threatening event (ALTE)
 - Young infants; gasping, cyanosis, apnea
- Hypoxia
 - Seizures, encephalopathy, death
- Pneumonia, pneumothorax

SIGNS & SYMPTOMS

- **Catarrhal**: nasal congestion; mild **cough**; sneezing; **low-grade fever**; red, watery eyes (similar to common cold)
- **Paroxysmal**: high-pitched **whooping** during **inhalation**; uncontrollable **coughing fits** → **vomiting**, fainting, rib fracture, petechiae in face, subconjunctival hemorrhages, hernias
- **Convalescent stage**: coughing improvement; decreased paroxysm, whooping; healing of airways

DIAGNOSIS

LAB RESULTS

- Nasopharyngeal swab culture (Bordet–Gengou agar)
 - Detects microbe; mercury drop colonies
- Polymerase chain reaction (PCR)
 - Detects microbe
- Serology
 - Detects microbe; antibody levels
- Complete blood count (CBC)
 - Leukocytosis (esp. young infants)

OTHER DIAGNOSTICS

- History, physical examination
 - Sudden, dramatic coughing attacks; lung sounds (e.g. whooping)

TREATMENT

MEDICATIONS

- Prophylactic
 - Diphtheria, tetanus, acellular pertussis (DTaP) **vaccine**
- Macrolide antibiotics

OTHER INTERVENTIONS

- Compulsory isolation of infected individual

FRANCISELLA TULARENSIS (TULAREMIA)

osms.it/francisella-tularensis

PATHOLOGY & CAUSES

- Infectious agent that **causes** zoonosis tularemia
- Facultative, gram-negative intracellular bacteria
- Highly infectious, virulent; potential bioterrorism agent

Transmission

- Direct **contact with infected animals** (e.g. inoculation of mucous membranes via contaminated hands/infected material)
- Ingestion of contaminated water/meat
- Airborne spread via contaminated materials (e.g. dust, hay, grass, lab specimens)
- Insect vectors
 - **Ticks**, mosquitoes, horse flies, fleas, lice

Pathophysiology

- *Francisella tularensis* enters body → phagocytosed by macrophages → impairs phagosome-lysosome fusion, rapidly proliferates within macrophage → infected macrophage undergoes apoptosis → bacteria released, infection spread

TYPES

- **Forms of tularemia:** ulceroglandular (75%), glandular, oculoglandular, oropharyngeal, pneumonic, typhoidal

RISK FACTORS

- Work-related
 - Lab workers, farmers, veterinarians, gardeners, hunters, butchers
- Skin exposure to vectors (esp. in summer)

COMPLICATIONS

- Lymph node suppuration, sepsis, renal failure, rhabdomyolysis, hepatitis, pneumonia

SIGNS & SYMPTOMS

- Fever, chills, malaise, lethargy, anorexia, chest/muscle soreness
- **Ulceroglandular:** papulo-ulcerative lesion at point of contact with animal/vector; lymphadenopathy
- **Glandular:** lymphadenopathy (no skin lesions)
- **Oculoglandular:** pain/irritation of eye; periorbital edema/erythema; increased tearing; photophobia; regional adenopathy
- **Oropharyngeal:** sore throat; cervical lymph node enlargement; pharyngitis; tonsillitis
- **Pneumonic:** dry cough; breathing difficulties; substernal chest pain
- **Typhoidal:** very high fever; abdominal pain; diarrhea; vomiting; diffuse abdominal tenderness



Figure 63.1 An ulcer on the skin of an individual with tularemia.

DIAGNOSIS

LAB RESULTS

- Culture
 - Buffered charcoal yeast extract (BCYE) agar
- PCR, direct fluorescent antibody (DFA) test
 - Detects microbe
- Serology
 - IgM, IgG antibodies appear after 2 weeks

OTHER DIAGNOSTICS

- History, physical examination

TREATMENT

MEDICATIONS

- Antibiotics (e.g. streptomycin, gentamicin, doxycycline)